ISO TC184/SC4/WG10 N267

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ISO/PDTS 10303-1002

Product data representation and exchange: Application module: Colour

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ABSTRACT:

This document is the draft technical specification of the application module for colour definition

KEYWORDS:

module, colour

COMMENTS TO READER:

This document has been reviewed and noted by the ISO TC 184/SC4 Quality Committee and SC4 Secretariat and has been determined to be ready for this ballot cycle.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50% of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed every three years with a view to deciding whether it can be transformed into an International Standard.

ISO/PDTS 10303-1002 was prepared by Technical Committee ISO/TC 184, Industrial automation systems and integration, Subcommittee SC4, Industrial data.

This International Standard is organized as a series of parts, each published separately. The parts of ISO 10303 fall into one of the following series: description methods, integrated resources, application interpreted constructs, application modules, application protocols, abstract test suites, implementation methods, and conformance testing. The series are described in ISO 10303-1. A complete list of parts of ISO 10303 is available from the Internet:

http://www.nist.gov/sc4/editing/step/titles/.

Annexes A and B form an integral part of this part of ISO 10303. Annexes, C, D, and E are for information only.

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation and exchange of product data. The objective is to provide a neutral mechanism capable of describing product data throughout the life cycle of a product, independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving.

This International Standard is organized as a series of parts, each published separately. The parts of ISO 10303 fall into one of the following series: description methods, integrated resources, application interpreted constructs, application protocols, application modules, abstract test suites, implementation methods, and conformance testing. The series are described in ISO 10303-1. This part of ISO 10303 is a member of the application module series.

This part of ISO 10303 specifies an application module for the definition of colour information. It does not provide specifications associated with the use of colours. Colours can be externally-defined, pre-defined or user-defined.

For an example of bringing together a set of application modules to provide the capability to assign shape elements to layers and visual attributes, such as colours and curve fonts, to geometric and topological elements, see Annex F of ISO 10303-1009.

Industrial automation systems and integration — Product data representation and exchange — Part 1002:

Application module: Colour

1 Scope

This part of ISO 10303 specifies the application module for colour.

The following are within scope of this part of ISO 10303:

— the definition of colour information.

The following are outside the scope of this part of ISO 10303:

— the specification of semantics associated with the use of colours.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 10303. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10303 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 8824-1:1994, Information technology — Open systems interconnection — Abstract syntax notation one (ASN.1) — Part 1: Specification of basic notation.

ISO 10303-1:1994, Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles.

ISO 10303-11:1994, Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual.

ISO/CD 10303-41:¹, Industrial automation systems and integration — Product data representation and exchange — Part 41: Integrated generic resource: Fundamentals of product description and support.

¹⁾ To be published.

ISO 10303-46:1994, Industrial automation systems and integration — Product data representation and exchange — Part 46: Integrated generic resources: Visual presentation.

ISO 10303-202:1996, Industrial automation systems and integration — Product data representation and exchange — Part 202: Application protocol: Associative draughting.

ISO 10303-1001: Industrial automation systems and integration — Product data representation and exchange — Application module: Appearance assignment.

3 Terms, definitions, and abbreviations

3.1 Terms defined in ISO 10303-1 For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-1 apply: - application; - application object; — application protocol; — application reference model; — data; — information; — integrated resource; - product; - product data; — unit of functionality. **3.2 Terms defined in ISO 10303-202** For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-202 apply: — application interpreted construct. 3.3 Terms defined in ISO 10303-1001

For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-1001 apply:

— application module.	
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¹⁾ To be published.

3.4 Abbreviations

For the purposes of this part of ISO 10303, the following abbreviations apply:

AM application module

ARM application reference model

MIM module integrated model

RGB red green blue

UoF unit of functionality

URL uniform resource locator

4 Information requirements

This clause specifies the information requirements for colour.

The information requirements are specified as a set of units of functionality and application objects. The information requirements are defined using the terminology of the subject area of this application module.

- 1 A graphical representation of the information requirements is given in annex C.
- 2 The mapping specification is specified in 5.1 which shows how the information requirements are met using the integrated resources of this International Standard. The use of the integrated resources introduces additional requirements which are common to application modules and application protocols.

EXPRESS specification:

```
*)
SCHEMA colour_arm;
```

4.1 Units of functionality

This subclause specifies the units of functionality (UoF) for this part of ISO 10303 as well as any support elements needed for the application module definition. This part of ISO 10303 specifies the following units of functionality:

— colour.

This part of ISO 10303 uses no other unit of functionality.

The units of functionality and a description of the functions that each UoF supports are given below. The application elements included in the UoFs are defined in 4.2.

4.1.1 Colour

The colour UoF specifies the definitional information for colour.

The following application entities are defined in the colour UoF:

- Colour;
- Externally_defined_colour;
- Pre_defined_colour;
- User_defined_colour.

4.2 ARM entity definitions

This subclause specifies the application entities for the colour module. Each application entity is an atomic element that embodies a unique application concept and contains attributes specifying the data elements of the entity. The application entities and their definitions are given below.

4.2.1 Colour

A Colour is a name for a property of reflecting light at a particular wavelength.

EXPRESS specification:

```
*)
ENTITY colour;
name : STRING;
END_ENTITY;
```

Attribute definitions:

name: The name specifies the word or group of words by which the Colour is known.

4.2.2 Externally_defined_colour

An Externally_defined_colour is a Colour that has its definition established and maintained by a source outside of ISO 10303.

EXPRESS specification:

```
*)
ENTITY externally_defined_colour
  SUBTYPE OF (colour);
  source : STRING;
END_ENTITY;
(*
```

Attribute definitions:

source: The **source** specifies the identification of the organization responsible for the Colour definition.

4.2.3 Pre_defined_colour

A Pre_defined_colour is a Colour that has its definition established and maintained in ISO 10303-46

EXPRESS specification:

```
*)
ENTITY pre_defined_colour
   SUBTYPE OF (colour);
END_ENTITY;
(*
```

4.2.4 User_defined_colour

A User_defined_colour is a Colour that has its definition established without referencing any standard.

EXPRESS specification:

```
*)
ENTITY user_defined_colour
  SUBTYPE OF (colour);
  red : REAL;
  green : REAL;
  blue : REAL;
WHERE
  WR1: {0.0 <= red <= 1.0};
  WR2: {0.0 <= green <= 1.0};
  WR3: {0.0 <= blue <= 1.0};
END_ENTITY;

END_SCHEMA;
(*
```

Attribute definitions:

red: the intensity of the red colour component.

green: the intensity of the green colour component.

blue: the intensity of the blue colour component.

Formal propositions:

WR1: The intensity of the red component shall be between 0.0 and 1.0.

WR2: The intensity of the green component shall be between 0.0 and 1.0.

WR3: The intensity of the blue component shall be between 0.0 and 1.0.

5 Module interpreted model

5.1 Mapping specification

This clause contains the mapping table that shows how each UoF and application element of this part of ISO 10303 (see clause 4) maps to one or several MIM resource constructs. The mapping table is organized in five columns. The contents of these five columns are:

Column 1) Application element: Name of an application element as it appears in the application entity definition. Application entity names are written in uppercase. Attribute names are listed after the application entity to which they belong and are written in lower case.

Column 2) MIM element: Name of an MIM element as it appears in the MIM, the term 'IDENTICAL MAPPING', or the term 'PATH'. MIM entities are written in lower case. Attribute names of MIM entities are referred to as <entity name>.<attribute name>. The mapping of an application element may result in several related MIM elements. Each of these MIM elements will require a line of its own in the table. The term 'IDENTICAL MAPPING' indicates that both application entities of an application assertion map to the same MIM element. The term 'PATH' indicates that the application assertion maps to the entire reference path.

Column 3) Source: For those MIM elements that are interpreted from the integrated resources, this is the number of the corresponding part of ISO 10303. For those MIM elements that are created for the purpose of this part of ISO 10303, this is the number of this part.

Column 4) Rules: One or more numbers may be given which refer to rules that apply to the current MIM element or reference path. For rules that are derived from relationships between application entities, the same rule is referred to by the mapping entries of all the involved MIM elements. The expanded names of the rules are listed after the table.

Column 5) Reference path: To describe fully the mapping of an application entity, it may be necessary to specify a reference path through several related MIM elements. The reference path column documents the role of a MIM element relative to the MIM element in the row succeeding it. Two or more such related MIM elements define the interpretation of the integrated resources that satisfies the requirement specified by the application entity. For each MIM element that has been created for use within this part of ISO 10303, a reference path up to its supertype from an integrated resource is specified.

For the expression of reference paths and the relationships between MIM elements, the following notational conventions apply:

- a) []: multiple MIM elements or sections of the reference path are required to satisfy an information requirement;
- b) () : multiple MIM elements or sections of the reference path are identified as alternatives within the mapping to satisfy an information requirement;
- c) {}: enclosed section constrains the reference path to satisfy an information requirement;
- d) ->: attribute references the entity or select type given in the following row;

- e) <-: entity or select type is referenced by the attribute in the following row;
- f) [i]: attribute is an aggregation of which a single member is given in the following row;
- g) [n]: attribute is an aggregation of which member n is given in the following row;
- h) => : entity is a supertype of the entity given in the following row;
- i) <= : entity is a subtype of the entity given in the following row;
- j) =: the string, select or enumeration type is constrained to a choice or value;
- k) \: the line continuation for strings that wrap.

Table 1 - Mapping table for colour UoF

Application_element	MIM element	Source	Rules	Reference path
COLOUR	colour	46		
name	colour_specification name	46		colour_specification<= colour
EXTERNALLY DEFINED_COLOUR	externally_defined colour	1002		externally_defined_colour<= [externally_defined_item] [colour_specification]<= colour
name	externally_defined colour.name	46		externally_defined_colour<= [externally_defined_item] [colour_specification]<= colour
source	external_source.source id	41		externally_defined_colour<= externally_defined_item.source-> external_source.source_id
PRE_DEFINED COLOUR	draughting_pre_defined colour	1002		draughting_pre_defined_colour<= pre_defined_colour<= [pre_defined_item] [colour]
name	draughting_pre_defined colour.name	1002		draughting_pre_defined_colour<= pre_defined_colour<= [pre_defined_item] [colour]
USER_DEFINED COLOUR	colour_rgb	46		colour_rgb<= colour_specification<= colour
name	colour_rgb.name	46		colour_rgb<= colour_specification<= colour

Table 1 - Mapping table for colour UoF

Application_element	MIM element	Source	Rules	Reference path
red	colour_rgb.red	46		colour_rgb<= colour_specification<=
				colour
green	colour_rgb.green	46		colour_rgb<= colour_specification<=
				colour
blue	colour_rgb.blue	46		colour_rgb<=
				colour_specification<=
				colour

5.2 MIM EXPRESS short listing

This clause specifies the EXPRESS schema that uses elements from the integrated resources, application interpreted constructs or application module MIMs and contains the types, entity specializations, rules, and functions that are specific to this part of ISO 10303. This clause also specifies modifications to the textual material for constructs that are imported from the integrated resources. The definitions and EXPRESS provided in the integrated resources or application interpreted constructs for constructs used in the MIM may include select list items and subtypes which are not imported into the MIM. Requirements stated in the integrated resources or application interpreted constructs which refer to such items and subtypes apply exclusively to those items which are imported into the MIM.

EXPRESS Specification:

NOTE 1 - See annex D for a graphical presentation of this schema using the EXPRESS-G notation.

NOTE 2 - The schema referenced above can be found in the following part of ISO 10303:

```
external_reference_schema ISO 10303-41

presentation_resource_schema ISO 10303-46

support_resource_schema ISO 10303-41
```

5.2.1 Application module entity definitions

This subclause contains the EXPRESS entity definitions in the MIM.

5.2.1.1 Draughting_pre_defined_colour

A draughting_pre_defined_colour is a pre_defined_colour that is identified by a name and is defined in this part of ISO 10303.

EXPRESS specification:

```
*)
ENTITY draughting_pre_defined_colour
SUBTYPE OF (pre_defined_colour);
WHERE
WR1: SELF.name IN
['red',
    'green',
    'blue',
```

```
'yellow',
'magenta',
'cyan',
'black',
'white'];
END_ENTITY;
(*
```

Formal propositions:

WR1: The name of the **draughting_pre_defined_colour** shall be 'red', 'green', 'blue', 'yellow', 'magenta', 'cyan', 'black', or 'white'.

Table 2 states the RGB values corresponding to each of the pre-defined colours that shall be supported by implementations of this part of ISO 10303.

		Γ	
Colour name	Red value	Green value	Blue value
black	0.0	0.0	0.0
red	1.0	0.0	0.0
green	0.0	1.0	0.0
blue	0.0	0.0	1.0
yellow	1.0	1.0	0.0
magenta	1.0	0.0	1.0
cyan	0.0	1.0	1.0
white	1.0	1.0	1.0

Table 2 - Colour RGB values

5.2.1.2 Externally_defined_colour

An externally_defined_colour is a colour that has its definition specified outside of ISO 10303.

EXPRESS specification:

```
*)
ENTITY externally_defined_colour
   SUBTYPE OF (colour_specification,externally_defined_item);
END_ENTITY; -- externally_defined_colour
(*
```

EXPRESS specification:

```
*)
END_SCHEMA;
(*
```

Annex A

(normative)

MIM short names

Table A.1 provides the short names for entities defined in the MIM of this part of ISO 10303. Requirements on the use of the short names are found in the implementation methods included in ISO 10303. The EXPRESS MIM short names are available from the Internet:

http://www.mel.nist.gov/div826/subject/apde/snr/

Table A.1 - MIM short names of entities

Entity name	Short name
DRAUGHTING_PRE_DEFINED_COLOUR	DPDC
EXTERNALLY_DEFINED_COLOUR	EXD1

Annex B

(normative)

Information object registration

B.1 Document identification

To provide for unambiguous identification of an information object in an open system, the object identifier

```
{ iso standard 10303 part(1002) version(-1) }
```

is assigned to this part of ISO 10303. The meaning of this value is defined in ISO/IEC 8824-1, and is described in ISO 10303-1.

B.2 Schema identification

To provide for unambiguous identification of the schema specifications given in this application module in an open information system, the object identifiers are assigned as follows:

```
{ iso standard 10303 part(1002) version(-1) object(1) colour-arm(1) }
```

is assigned to the colour_arm schema.

```
{ iso standard 10303 part(1002) version(-1) object(2) colour-mim(1) }
```

is assigned to the colour_mim schema. The meaning of this value is defined in ISO 8824-1, and is described in ISO 10303-1.

Annex C (informative)

ARM EXPRESS-G

The following diagrams correspond to the ARM EXPRESS listing given in clause 4. The diagrams use the EXPRESS-G graphical notation for the EXPRESS language. EXPRESS-G is defined in annex D of ISO 10303-11.

NOTE - The inter-page referencing is to the diagram number and not the figure number.

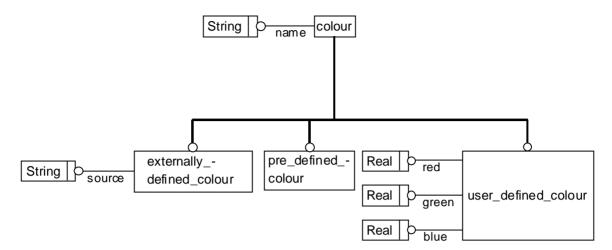


Figure C.1 - ARM EXPRESS-G diagram 1 of 1

Annex D

(informative)

MIM EXPRESS-G

The following diagrams correspond to the MIM EXPRESS expanded listing. The diagrams use the EXPRESS-G graphical notation for the EXPRESS language. EXPRESS-G is defined in annex D of ISO 10303-11.

NOTE - The inter-page referencing is to the diagram number and not the figure number.

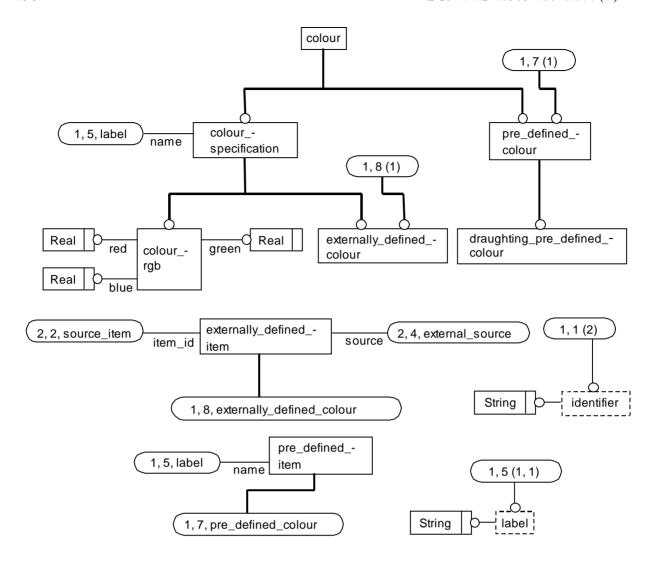


Figure D.1 - MIM EXPRESS-G diagram 1 of 2

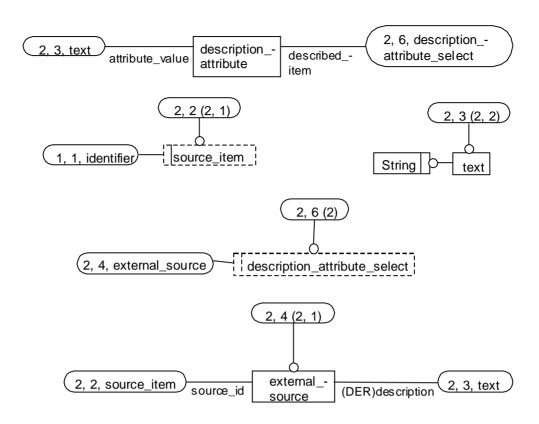


Figure D.2 - MIM EXPRESS-G diagram 2 of 2

Annex E (informative)

AM ARM and MIM EXPRESS

This annex provides a listing of the EXPRESS for the ARM specified in clause 4 and EXPRESS schema specified in 5.2 of this part of ISO 10303 without comments or other explanatory text. The content of this annex is available in computer-interpretable form and can be found at the following URLs:

http://www.nist.gov/sc4/nwi_pwi/nwi/step/part1002/colour_arm.exp

http://www.nist.gov/sc4/nwi_pwi/nwi/step/part1002/colour_mim.exp

Bibliography

- [1] ISO 10303-1001: Industrial automation systems and integration Product data representation and exchange Application module: Appearance assignment.
- [2] ISO 10303-1003:¹, Industrial automation systems and integration Product data representation and exchange Application module: Curve appearance.
- [3] ISO 10303-1004: Industrial automation systems and integration Product data representation and exchange Application module: Elemental shape.
- [4] ISO 10303-1005: Industrial automation systems and integration Product data representation and exchange Application module: Elemental topological shape.
- [5] ISO 10303-1006: Industrial automation systems and integration Product data representation and exchange Application module: Foundation representation.
- [6] ISO 10303-1007: Industrial automation systems and integration Product data representation and exchange Application module: General surface appearance.
- [7] ISO 10303-1008: Industrial automation systems and integration Product data representation and exchange Application module: Layer assignment.
- [8] ISO 10303-1009: Industrial automation systems and integration Product data representation and exchange Application module: Shape appearance and layers.
- [9] ISO TC 184/SC4 1997, Proposed Standing Document Guidelines for application module development, revision 0.6 http://wg10step.aticorp.org/Deliverables/Guidelines/AMContent/Draft6/AMConGde06.html >.

¹⁾ To be published

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